AIRS Data Assimilation at the Met Office

Andrew Collard and Roger Saunders

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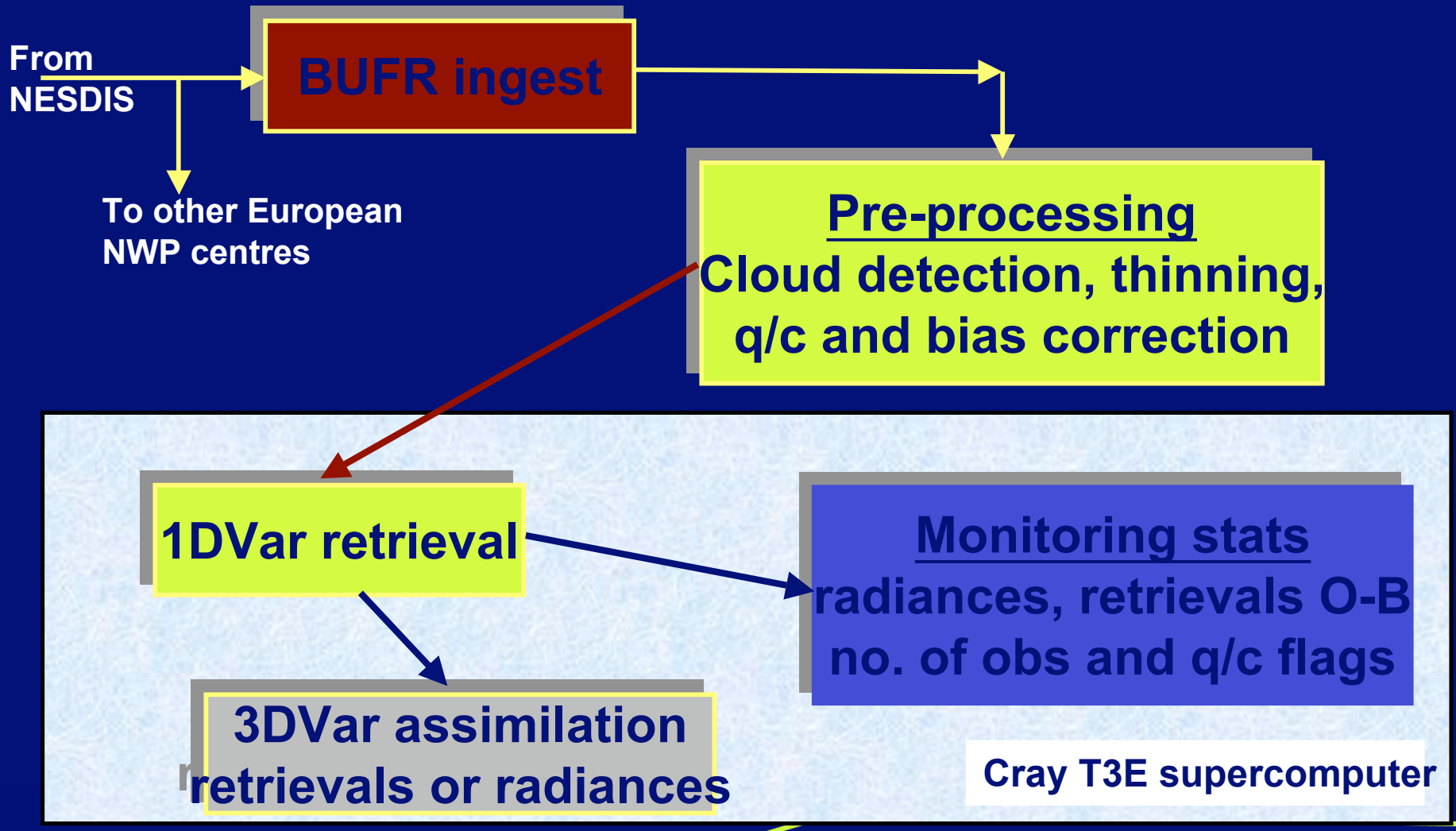
Introduction

- Processing Overview
- Data Formats
- Fast Radiative Transfer Models
- Cloud Detection
- Monitoring
- Project Milestones

AIRS processing



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Current Status

- 1DVar and Preprocessing code is in place - testing continues
- The AIRS simulated data is stored routinely on our MetDB archive

BUFR code Definition

- Work has been proceeding to finalise the BUFR format to be used to distribute BUFR code
- Currently receiving 228 channels but will soon receive 281.
- Currently using a format based on HIRS-1c for combined AIRS/AMSU/HSB dataset.
- Outstanding issues include storage of data from AIRS visible channels, cloud flags and instrument temperatures.
- Meeting at ECMWF today to discuss this

Fast RT Models

- We require fast radiative transfer models which can also generate Jacobians.
- RTTOV-7 (due for release in Jan 2002) now has AIRS capability
- Gastropod is also available and is being tested against the RTTOV model
- (We can use either in our processing software)
- Gastropod/RTTOV-7 intercomparisons will be used as guidelines for upgrades to AIRS simulations in RTTOV-8

Cloud Detection

- Work is being done on an EOF based approach to detect cloud in the pre-processing phase. (Lee, Smith and Taylor, 2001)
- We plan to do final cloud detection using the single-view variational technique detailed in the last meeting
- Our day-one processing system requires cloud-free not cloud-cleared radiances.

Cloud Detection using EOFs

This method is being developed at the Met Office by A.C.L Lee, J.A. Smith, and J.P.Taylor:

From a set of known clear spectra, derive the set of leading EOFs, **U**.

Each given spectrum, **x**, can then be expressed as a set of predictors, **c**, and a residual, **r**, thus:

so that

Ideally there will be few clear sky spectral signatures not in **U**. **r** should contain noise and spectral features found only in cloudy spectra

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Cloud Detection using EOFs contd.

For a set of spectra from cloudy fields of view, one can resolve the residual spectrum, **r**, (i.e., the spectrum with the clear signatures removed) to determine the EOFs, $\mathbf{U_2}$, that are indicative of cloud.

For the spectrum to be tested, project **r** onto $\mathbf{U_2}$ and look for significant values in the eigenvalues, $\mathbf{c_2}$.

This has been tested on simulated IASI data and on data obtained from the Met Office's ARIES airborne interferometer

Preliminary results indicate that clouds producing brightness temperature changes down to ~1K can be detected.

Monitoring of AIRS Radiances

- Initial monitoring (after pre-processing which includes a 1DVar retrieval) is by inspection of the (Observed-Background) and (Observed-Retrieved) statistics
  - Check that statistics are as expected from error estimates
  - Look for jumps and instabilities in statistics that may indicate instrument anomalies

Monitoring of AIRS Radiances contd.

- Approx. six months* after initial data reception we will run trials
  - Look for positive impact from AIRS data
  - Verification is against both analysis and observations (i.e., radiosondes)

*Depending on final AIRS RT model being available

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Project Timeline

Dec 2001 Deliver assimilation code

Launch + 3 months Start monitoring radiances

Launch + 9 months Start assimilation trials

Launch + 18 months Report results of trials

Launch + ?? months Operational assimilation*

*This date will be dependent on Met Office relocation

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Thank you!